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Fragile-to-strong transition in metallic glass-forming liquids

Chunzhi Zhang¹, Lina Hu¹, Yuanzheng Yue^{1,2}, and John C. Mauro³

¹Laboratory of Liquid Structure, Shandong University, Jinan 250061, China

²Section of Chemistry, Aalborg University, DK-9000 Aalborg, Denmark

³Science and Technology Division, Corning Incorporated, Corning, New York, USA

Abstract

Two of the earth's most abundant substances, water and silica, exhibit some of the most unusual properties in nature. Among these is an anomalous scaling of liquid dynamics, which appear non-Arrhenius (or “fragile”) at high temperatures yet Arrhenius (or “strong”) at low temperatures. Here we show that this fragile-to-strong (F-S) transition is not limited to a few liquids like water and silica, but is possibly a general behaviour of metallic glass-forming liquids (MGFLs). We also propose a general model for the viscosity of F-S liquids that captures the scaling of dynamics across both the fragile and strong regimes.